WHAT IS CLAIMED IS:

1   1.   A method for using business data comprising:

2   obtaining an operation to be performed on a data set and corresponding input data;

3   using a SQL integration object definition to determine a structure of the data set; and

4   constructing at least one SQL statement conforming to the structure to perform the operation

5   on the data set according to the input data, wherein executing the at least one SQL

6   statement on the data set performs the operation.

1   2.   The method of claim 1 further comprising:

2   executing each SQL statement of the at least one SQL statement on the data set once said

3   each SQL statement is constructed such that said each SQL statement is executed

4   prior to constructing a subsequent SQL statement of the at least one SQL statement.

1   3.   The method of claim 1 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables; and

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, wherein

7   the parent component definition corresponds to a parent table of the tables;

8   and

9   the parent component definition comprises a target key definition, the target

10   key definition corresponding to a target key of the parent table;

11   a child component definition of the parent/child relationship, wherein

12   the child component definition corresponds to a child table of the tables; and

13   the child component definition comprises a foreign key definition, the foreign

14   key definition corresponding to a foreign key of the child table;

15   and further comprising:

16   determining that a parent record of the parent table corresponds to a parent of a child record

17   of the child table when the target key of the parent record comprises a value of the

18   foreign key of the child record.

1   4.   The method of claim 1 further comprising:

2   identifying an instance of the SQL integration object definition in the input data;

-53-

3   and wherein

4   the SQL integration object definition comprises a SQL integration component

5   definition;

6   the SQL integration component definition corresponds to a table of the data set;

7   the SQL integration component definition comprises a SQL integration field

8   definition;

9   the SQL integration field definition corresponds to a column of the table;

10   and

11   the constructing the at least one SQL statement comprises:

12   using the instance to identify a data value for an instance of the SQL

13   integration field definition in the input data; and

14   concatenating a clause to a first SQL statement of the at least one SQL

15   statement to select a record from the table, the record having the data

16   value for the column.

1   5.   The method of claim 4 further comprising:

2   identifying a second instance of the SQL integration object definition in the input data;

3   and wherein

4   the constructing the at least one SQL statement further comprises:

5   using the second instance to identify a second data value for the SQL

6   integration field definition; and

7   concatenating an OR clause to the first SQL statement to select a second

8   record from the table, the second record having the second data value

9   for the column.

1   6.   The method of claim 5 further comprising:

2   determining whether the first SQL statement comprises a maximum number of SQL clauses;

3   and

4   when the first SQL statement comprises the maximum number,

5   constructing a new SQL statement;

6   and

7   when the first SQL statement does not comprise the maximum number,

8   performing the concatenating the second clause to the first SQL statement.

1   7.   The method of claim 4 wherein

2   the identifying comprises identifying a plurality of instances; and

3   the at least one SQL statement comprises a plurality of SQL statements;

4   and further comprising:

5   executing the plurality of SQL statements, wherein

6   the executing produces a plurality of result sets;

7   and

8   joining the result sets to produce output data.

1   8.   The method of claim 1 further comprising:

2   executing the at least one SQL statement on the data set to produce a result set; and

3   using the result set to produce output data.

1   9.   The method of claim 1 wherein

2   the SQL integration object definition comprises a SQL integration component definition;

3   the SQL integration component definition corresponds to a table of the data set;

4   the input data comprises an instance of the SQL integration object definition, the instance

5   comprising a search specification for the SQL integration component definition;

6   and

7   the constructing the at least one SQL statement comprises constructing a current component

8   SQL statement to retrieve data from the table according to the search specification.

1   10.   The method of claim 1 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the constructing the at least one SQL statement comprises:

6   selecting a current component definition of the SQL integration component

7   definitions; the current component definition corresponding to a current table

8   of the tables; and

9   performing the following:

10   when the input data comprises an instance of the current component definition,

11   generating a first SQL statement to select a record from the current

12   table, the record corresponding to the instance;

13   when the input data does not comprise the instance and the input data

14   comprises a descendant instance of a descendant component definition

15   of the current component definition, generating a second SQL

16   statement to select all records from the current table.

1   11.   The method of claim 10 further comprising:

2   executing one of the first SQL statement and the second SQL statement.

1   12.   The method of claim 11 wherein

2   the executing one of the first SQL statement and the second SQL statement produces a

3   current component result set.

1   13.   The method of claim 10 further comprising:

2   when the input data does not comprise the instance and the input data does not comprise the

3   descendant instance,

4   determining whether a hierarchy of output data is limited; and

5   when the hierarchy is not limited,

6   determining whether the SQL integration object definition comprises a

7   child component definition of the current component definition,

8   the child component definition corresponding to a child table of

9   the tables; and

10   when the child component definition exists,

11   generating a third SQL statement to select all records

12   from the child table.

1   14.   The method of claim 13 further comprising:

2   executing one of the first SQL statement and the second SQL statement; and

3   executing the third SQL statement.

1   15.   The method of claim 13 wherein

2   the determining whether the hierarchy is limited comprises determining whether a template

3   query parameter is set; and

4   when the template query parameter is set, determining that the hierarchy is limited;

5   and

6   when the template query parameter is not set, determining that the hierarchy is not

-56-

7   limited.

1   16. The method of claim 10 further comprising:

2 when the input data does not comprise the instance and the input data does not comprise the

3   descendant instance,

4   determining whether a hierarchy of output data is limited; and

5   when the hierarchy is not limited,

6   determining whether the SQL integration object definition comprises a

7   sibling component definition of the current component

8   definition, the sibling component definition corresponding to a

9   sibling table of the tables; and

10   when the sibling component definition exists,

11   generating a fourth SQL statement to select all records

12   from the sibling table.

1   17. The method of claim 16 further comprising:

2 executing one of the first SQL statement and the second SQL statement; and

3 executing the fourth SQL statement.

1   18. The method of claim 16 wherein

2 the determining whether the hierarchy is limited comprises determining whether a template

3   query parameter is set; and

4   when the template query parameter is set, determining that the hierarchy is limited;

5   and

6   when the template query parameter is not set, determining that the hierarchy is not

7   limited.

1   19. The method of claim 1 wherein

2 the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4 the data set comprises a plurality of tables;

5 the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, the parent component

7   definition corresponding to a parent table of the data set; and

8   a child component definition of the parent/child relationship, the child component

9   definition corresponding to a child table of the data set;

10   and

11   the constructing comprises:

12   constructing a current component SQL statement for the child component definition

13   to select a child record of the child table corresponding to a child instance of

14   the child component definition from the input data;

15   using the parent/child relationship for identifying the parent component definition, the

16   parent component definition determining a parent result set, the parent result

17   set comprising a parent instance; and

18   using the parent result set for adding a parent selection clause to the current

19   component SQL statement to provide a final SQL statement.

1   20.   The method of claim 19 further comprising:

2   executing the final SQL statement.

1   21.   The method of claim 19 wherein

2   the parent component definition comprises a target key definition for a target key of the

3   parent table;

4   the child component definition comprises a foreign key definition for a foreign key of the

5   child table; and

6   the using the parent result set for adding the parent selection clause comprises:

7   constructing the parent selection clause by generating a parent instance clause to

8   select the child record from the child table, wherein

9   the parent instance clause further selects the child record when the foreign key

10   of the child record comprises a value of the target key from the parent

11   instance.

1   22.   The method of claim 1 wherein

2   the constructing comprises constructing a query of the data set, wherein a result set of the

3   query is used to load a SQL integration object instance as output data, the SQL

4   integration object instance conforming to the SQL integration object definition.

1   23.   The method of claim 1 wherein

2   the constructing comprises constructing a SQL statement for performing one of updating.

3   inserting, synchronizing and deleting data in the data set.

1   24.   The method of claim 1 wherein

2   the operation comprises upserting the input data into a destination data set;

3   the SQL integration object definition comprises a SQL integration component definition;

4   the SQL integration component definition corresponds to a table of the destination data set;

5   and

6   the constructing the at least one SQL statement comprises:

7   determining whether the table comprises a record corresponding to an instance of the

8   SQL integration component definition from the input data; and

9   when the table comprises the record, constructing a first SQL statement to

10   update the record with data corresponding to the instance; and

11   when the table does not comprise the record, constructing a second SQL

12   statement to insert a new record with data corresponding to the

13   instance.

1   25.   The method of claim 24 further comprising:

2   executing one of the first SQL statement and the second SQL statement.

1   26.   The method of claim 1 wherein

2   the operation comprises upserting the input data into a destination data set;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   a first component definition of the SQL integration component definitions comprises a parent

7   component definition of a parent/child relationship, the parent component definition

8   corresponding to a parent table of the destination data set;

9   a second component definition of the SQL integration component definitions comprises a

10   child component definition of the parent/child relationship, the child component

11   definition corresponding to a child table of the destination data set;

12 and

13 the constructing the at least one SQL statement comprises:

14   selecting a current component definition of the SQL integration component

15   definitions, the current component definition corresponding to a current table

16   of the tables; and

17   performing the following for the current component definition:

18   when the current component definition is the child component definition,

19   checking whether an optimized upsert of a plurality of current

20   component instances of the current component definition from

21   the input data can be performed; and

22   when the optimized upsert can be performed,

23   constructing a first set of at least one SQL statement for

24   performing the optimized upsert on the child

25   table;

26   when the optimized upsert cannot be performed,

27   constructing a second set of at least one SQL statement

28   to upsert the current component instances into

29   the child table;

30   when the current component definition is not the child component definition,

31   constructing a third set of at least one SQL statement to upsert the

32   current component instances into the current table.

1   27.   The method of claim 26 further comprising:

2   executing one of the first set, the second set, and the third set.

1   28.   The method of claim 25 wherein the constructing the first set comprises:

2   selecting a current parent instance of the parent component definition from the input data;

3   determining a number of child instances of the child component definition from the input

4   data, the child instances corresponding to children of the current parent instance;

5   retrieving a parent record corresponding to the current parent instance from the parent table;

6   determining a number of child records from the child table, wherein the child records are

7   children records of the parent record; and

8   determining a ratio of the number of children instances to the number of child records, and

9   when the ratio exceeds a predetermined limit,

10   determining in memory an associated operation of an update operation and an

11   insert operation for each child instance of the child instances,

12   and

13   when the ratio does not exceed the predetermined limit,

14   accessing the destination data set for each child instance of the child instances

15   for determining the associated operation for each child instance of the

16   child instances.

1   29.   The method of claim 27 wherein

2   the determining in memory the associated operation for each child instance of the child

3   instances comprises:

4   retrieving children records of the parent record from the child table into memory; and

5   performing the following for each child instance of the child instances:

6   selecting the child instance as a current child instance of the child instances;

7   using the children records in memory to determine the associated operation for

8   the current child instance; and

9   constructing an associated SQL statement for performing the associated

10   operation on the child table.

1   30.   The method of claim 29 further comprising:

2   executing the associated SQL statement for each child instance of the child instances.

1   31.   The method of claim 27 wherein

2   the accessing the destination data set for each child instance of the child instances comprises

3   performing the following for each child instance of the child instances:

4   selecting the child instance as a current child instance; and

5   constructing an associated SQL statement for upserting a record corresponding

6   to the current child instance in the destination data set.

1   32.   The method of claim 31 further comprising:

2   executing the associated SQL statement for each child instance of the child instances.

1   33.   The method of claim 1 wherein

2   the operation is a delete record hierarchy operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the SQL integration component definitions comprise:

6   a root component definition, the root component definition corresponding to a root

7   table of a plurality of tables of the destination data set;

8   a descendant component definition, the descendant component definition

9   corresponding to a descendant table of the tables, the descendant component

10   definition corresponding to a descendant of the root component definition;

11   the constructing the at least one SQL statement comprises:

12   selecting a root instance of the root component definition from the input data;

13   marking a root record of the root table corresponding to the root instance;

14   when a cascade delete parameter is set for the descendant component definition,

15   selecting at least one descendant record of the descendant table, wherein

16   the at least one descendant record corresponds to a descendant of the

17   root record, and

18   marking the at least one descendant record;

19   constructing a root SQL statement for deleting the marked root record from the root

20   table; and

21   constructing a descendant SQL statement for deleting the at least one marked

22   descendant record from the descendant table.

1   34.   The method of claim 33 further comprising:

2   executing the root SQL statement and the descendant SQL statement.

1   35.   The method of claim 1 wherein

2   the operation comprises a reverse query operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   the SQL integration component definitions comprise:

7   a first parent component definition of a first parent/child relationship, the first parent

8   component definition corresponding to a first parent table of the tables;

9   a first child component definition of the first parent/child relationship, the first child

10   component definition corresponding to a first child table of tables;

11   and

12   the constructing the at least one SQL statement comprises:

13   constructing a first SQL statement for selecting a first child record from the first child

14   table, wherein

15   the first child record corresponds to an instance of the first child component

16   definition from the input data;

17   and

18   constructing a second SQL statement for selecting a first parent record from the first

19   parent table, wherein the first parent record corresponds to a parent of the first

20   child record.

1   36.   The method of claim 35 further comprising:

2   executing the first SQL statement and the second SQL statement.

1   37.   The method of claim 35 wherein

2   the first parent component definition comprises a target key definition, the target key

3   definition corresponding to a target key of the first parent table;

4   the first child component definition comprises a foreign key definition, the foreign key

5   definition corresponding to a foreign key of the first child table;

6   the first parent record corresponds to the parent of the first child record when the target key

7   of the first parent record comprises a value of the foreign key of the first child record.

1   38.   The method of claim 37 wherein

2   the SQL integration component definitions further comprise:

3   a third component definition, the third component definition corresponding to a third

4   table of the tables;

5   the first parent component definition corresponds to a second child component definition of a

6   second parent/child relationship,

7   the third component definition corresponds to a second parent component definition of the

8   second parent/child relationship;

9   and further comprising:

10   constructing a third SQL statement for selecting a third record from the third table, the

11   third record corresponding to a parent of the first parent record.

1   39.   The method of claim 38 further comprising:

2   executing the first SQL statement, the second SQL statement, and the third SQL statement.

1   40.   The method of claim 37 wherein

2   the third component definition comprises a target key definition, the target key definition

3   corresponding to a target key of the third table;

4   the second child component definition comprises a foreign key definition, the foreign key

5.   definition corresponding to a foreign key of the first parent table;

6   the third record corresponds to the parent of the first parent record when the target key of the

7   third record comprises a value of the foreign key of the first parent record.

1   41.   The method of claim 1 wherein

2 the operation comprises a synchronize operation;

3 the data set comprises a destination data set;

4 the input data comprises a source data set; and

5 the constructing the SQL statement comprises constructing a plurality of SQL statements, the

6   constructing the plurality of SQL statements comprising:

7   constructing and executing at least one query SQL statement to query the source data

8   set for all records, wherein

9   the executing the at least one query SQL statement produces a result set;

10   constructing at least one upsert SQL statement to upsert the result set into the

11   destination data set; and

12   constructing at least one delete SQL statement for deleting an old record in the

13   destination data set that does not have a corresponding record in the source

14   data set.

1   42.   The method of claim 41 further comprising:

2 executing the at least one query SQL statement, the at least one upsert SQL statement, and

3   the at least one delete SQL statement.

1   43.   The method of claim 1 wherein

2 the operation comprises one of a group consisting of the following:

3   an upsert operation, wherein the corresponding input data includes an upsert instance

4   of the SQL integration object definition, wherein an update record

5   corresponding to the upsert instance is to be upserted into the data set;

6   a delete operation, wherein the corresponding input data includes a delete instance of

7   a root component definition of the SQL integration object definition, a delete

8   record corresponding to the delete instance to be deleted from the data set;

9   an update operation, wherein the corresponding input data includes an update instance

10   of the SQL integration object definition, wherein an update record

11   corresponding to the update instance is to be updated in the data set;

-64-

12   an insert operation, wherein the corresponding input data includes an insert instance

13   of the SQL integration object definition, wherein an insert record

14   corresponding to the insert instance is to be inserted into the data set;

15   a query operation, wherein the corresponding input data includes a query instance of

16   the SQL integration object definition, the query instance providing a first

17   search specification;

18   a reverse query operation, wherein the corresponding input data includes a reverse

19   query instance of the SQL integration object definition, the reverse query

20   instance providing a second search specification;

21   a delete hierarchy operation, wherein the corresponding input data includes a root

22   instance of a root component definition of the SQL integration object

23   definition, wherein a root record corresponding to the root instance and

24   descendants of the root record are to be deleted from the data set;

25   a cascading delete operation, wherein the corresponding input data includes a root

26   instance of a root component definition of the SQL integration object

27   definition, wherein a root record corresponding to the root instance is to be

28   deleted from the data set, and wherein a descendant record of the root record is

29   to be deleted when a cascade delete parameter is set;

30   a synchronize operation, wherein the corresponding input data includes a second data

31   set to be synchronized with the data set; and

32   an execute operation comprising at least one of the upsert operation, the update

33   operation, the insert operation, the query operation, the reverse query

34   operation, the delete operation, the cascading delete operation, and the

35   synchronize operation.

1   44.   A method for using business data comprising:

2 obtaining an operation to be performed on a data set and corresponding input data;

3 constructing at least one SQL statement to perform the operation on the data set according to

4   the input data; and

5 executing each SQL statement of the at least one SQL statement on the data set once said

6   each SQL statement is constructed such that said each SQL statement is executed

7   prior to constructing a subsequent SQL statement of the at least one SQL statement.

1   45.   The method of claim 44 wherein

2   the constructing the subsequent SQL statement uses a result set of executing a prior SQL

3   statement.

1   46.   The method of claim 44 wherein

2   the operation comprises a query operation.

1   47.   The method of claim 44 wherein

2   the operation comprises a reverse query operation.

1   48.   The method of claim 44 wherein

2   the operation comprises a delete record hierarchy operation.

1   49.   The method of claim 44 wherein

2   the operation comprises an upsert operation.

1   50.   The method of claim 44 wherein

2   the operation comprises a synchronize operation.

1   51.   A computer system comprising:

2   a processor; and

3   a memory, the memory comprising instructions, the processor for executing the instructions,

4   the instructions comprising:

5   obtaining instructions to obtain an operation to be performed on a data set and

6   corresponding input data;

7   structure determining instructions to use a SQL integration object definition to

8   determine a structure of the data set; and

9   constructing instructions to construct at least one SQL statement conforming to the

10   structure to perform the operation on the data set according to the input data,

11   wherein executing the at least one SQL statement on the data set performs the

12   operation.

1   52.   The computer system of claim 51 wherein the instructions further comprise:

2   executing instructions to execute the at least one SQL statement.

1   53.   The computer system of claim 51 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables; and

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, wherein

7   the parent component definition corresponds to a parent table of the tables;

8   and

9   the parent component definition comprises a target key definition, the target

10   key definition corresponding to a target key of the parent table; and

11   a child component definition of the parent/child relationship, wherein

12   the child component definition corresponds to a child table of the tables; and

13   the child component definition comprises a foreign key definition, the foreign

14   key definition corresponding to a foreign key of the child table;

15   and further comprising:

16   parent determining instructions to determine that a parent record of the parent table

17   corresponds to a parent of a child record of the child table when the target key of the

18   parent record comprises a value of the foreign key of the child record.

1   54.   The computer system of claim 51 further comprising:

2   instance identifying instructions to identify an instance of the SQL integration object

3   definition in the input data;

4   and wherein

5   the SQL integration object definition comprises a SQL integration component

6   definition;

7   the SQL integration component definition corresponds to a table of the data set;

8   the SQL integration component definition comprises a SQL integration field

9   definition;

10   the SQL integration field definition corresponds to a column of the table;

11   and

12   the constructing instructions comprise:

13   value determining instructions to use the instance to identify a data value for

14   an input instance of the SQL integration field definition in the input

15   data; and

16   concatenating instructions to concatenate a clause to a first SQL statement of

17   the at least one SQL statement to select a record from the table, the

18   record having the data value for the column.

-67-

1   55.   The computer system of claim 54 wherein

2   the instance identifying instructions further identify a second input instance of the SQL

3   integration object definition in the input data; and

4   the constructing instructions further perform the following:

5   use the second instance to identify a second data value for the SQL integration field

6   definition; and

7   concatenate an OR clause to the first SQL statement to select a second record from

8   the table, the second record having the second data value for the column.

1   56.   The computer system of claim 55 wherein the instructions further comprise:

2   length determining instructions to determine whether the first SQL statement comprises a

3   maximum number of SQL clauses, and

4   when the first SQL statement comprises the maximum number,

5   construct a new SQL statement,

6   and

7   when the first SQL statement does not comprise the maximum number,

8   perform the concatenating the second clause to the first SQL statement.

1   57.   The computer system of claim 51 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the constructing instructions comprise:

6   selecting instructions to select a current component definition of the SQL integration

7   component definitions, the current component definition corresponding to a

8   current table of the tables; and

9   generating instructions to perform the following:

10   when the input data comprises an instance of the current component definition,

11   generate a first SQL statement to select a record from the current table,

12   the record corresponding to the instance; and

13   when the input data does not comprise the instance and the input data

14   comprises a descendant instance of a descendant component definition

-68-

15   of the current component definition, generate a second SQL statement

16   to select all records from the current table.

1   58.   The computer system of claim 57 wherein the generating instructions further

2   comprise:

3   hierarchy determining instructions to determine whether a hierarchy of output data is

4   limited when the input data does not comprise the instance and the input data

5   does not comprise the descendant instance; and

6   child generating instructions to perform the following:

7   when the hierarchy is not limited,

8   determine whether the SQL integration object definition comprises a

9   child component definition of the current component definition,

10   the child component definition corresponding to a child table of

11   the tables, and

12   when the child component definition exists,

13   generate a third SQL statement to select all records

14   from the child table.

1   59.   The computer system of claim 51 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, the parent component

7   definition corresponding to a parent table of the data set; and

8   a child component definition of the parent/child relationship, the child component

9   definition corresponding to a child table of the data set;

10   and.

11   the constructing instructions further comprise:

12   current component constructing instructions to construct a current component SQL

13   statement for the child component definition to select a child record of the

14   child table corresponding to a child instance of the child component definition

15   from the input data;

16   parent identifying instructions to use the parent/child relationship for identifying the

17   parent component definition, the parent component definition determining a

18   parent result set, the parent result set comprising a parent instance; and

19   parent selection clause adding instructions to use the parent result set to add a parent

20   selection clause to the current component SQL statement to provide a final

21   SQL statement.

1   60.   The computer system of claim 59 wherein

2   the parent selection clause adding instructions comprise:

3   parent instance clause generating instructions to generate a parent instance clause to

4   select the child record from the child table, wherein

5   the parent instance clause further selects the child record when the foreign key

6   of the child record comprises a value of the target key from the parent

7   instance.

1   61.   The computer system of claim 51 wherein

2   the operation comprises upserting the input data into a destination data set;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   a first component definition of the SQL integration component definitions comprises a parent

7   component definition of a parent/child relationship, the parent component definition

8   corresponding to a parent table of the destination data set;

9   a second component definition of the SQL integration component definitions comprises a

10   child component definition of the parent/child relationship, the child component

11   definition corresponding to a child table of the destination data set;

12   and

13   the constructing instructions comprise:

14   selecting instructions to select a current component definition of the SQL integration

15   component definitions, the current component definition corresponding to a

16   current table of the tables; and

17   performing instructions to perform the following for the current component definition:

18   when the current component definition is the child component definition,

19   check whether an optimized upsert of a plurality of current component

20   instances of the current component definition from the input

21   data can be performed; and

22   when the optimized upsert can be performed,

23   construct a first set of at least one SQL statement for

24   performing the optimized upsert on the child

25   table; and

26   when the optimized upsert cannot be performed,

27   construct a second set of at least one SQL statement to

28   upsert the current component instances into the

29   child table;

30   and

31   when the current component definition is not the child component definition,

32   construct a third set of at least one SQL statement to upsert the current

33   component instances into the current table.

1   62.   The computer system of claim 61 wherein the performing instructions to

2   construct the first set comprise:

3   calculating instructions to perform the following:

4   select a current parent instance of the parent component definition from the input

5   data;

6   determine a number of child instances of the child component definition from the

7   input data, the child instances corresponding to children of the current parent

8   instance;

9   retrieve a parent record corresponding to the current parent instance from the parent

10   table;

11   determine a number of child records from the child table, wherein the child records

12   are children records of the parent record; and

13   determine a ratio of the number of children instances to the number of child records,

14   and

15   when the ratio exceeds a predetermined limit,

16   determine in memory an associated operation of an update operation and an

17   insert operation for each child instance of the child instances,

18   and

19   when the ratio does not exceed the predetermined limit,

20   access the destination data set for each child instance of the child instances to

-71-

21   determine the associated operation for each child instance of the child

22   instances.

1   63.   The computer system of claim 62 wherein

2   the calculating instructions to determine in memory the associated operation for each child

3   instance of the child instances comprise:

4   retrieving instructions to retrieve children records of the parent record from the child

5   table into memory; and

6   in-memory instructions to perform the following for each child instance of the child

7   instances:

8   select the child instance as a current child instance of the child instances;

9   use the children records in memory to determine the associated operation for

10   the current child instance; and

11   construct an associated SQL statement for performing the associated operation

12   on the child table.

1   64.   The computer system of claim 51 wherein

2   the operation is a delete record hierarchy operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the SQL integration component definitions comprise:

6   a root component definition, the root component definition corresponding to a root

7   table of a plurality of tables of the destination data set;

8   a descendant component definition, the descendant component definition

9   corresponding to a descendant table of the tables, the descendant component

10   definition corresponding to a descendant of the root component definition;

11   and

12   the constructing instructions further comprise:

13   root selecting instructions to select a root instance of the root component definition

14   from the input data;

15   root marking instructions to mark a root record of the root table corresponding to the

16   root instance;

17   descendant selecting instructions to perform the following:

18   when a cascade delete parameter is set for the descendant component

19   definition,

20   select at least one descendant record of the descendant table wherein

21   the at least one descendant record corresponds to a descendant

22   of the root record, and

23   mark the at least one descendant record;

24   root constructing instructions to construct a root SQL statement to delete the marked

25   root record from the root table; and

26 descendant constructing instructions to construct a descendant SQL statement to

27   delete the at least one marked descendant record from the descendant table.

1   65.   The computer system of claim 51 wherein

2   the operation comprises a reverse query operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   the SQL integration component definitions comprise:

7   a first parent component definition of a first parent/child relationship, the first parent

8   component definition corresponding to a first parent table of the tables;

9   a first child component definition of the first parent/child relationship, the first child

10   component definition corresponding to a first child table of tables;

11 and

12 the constructing instructions comprise:

13   first constructing instructions to construct a first SQL statement for selecting a first

14   child record from the first child table, wherein

15   the first child record corresponds to an instance of the first child component

16   definition from the input data;

17   and

18   second constructing instructions to construct a second SQL statement for selecting a

19   first parent record from the first parent table, wherein the first parent record

20   corresponds to a parent of the first child record.

1   66.   The computer system of claim 65 wherein

2   the first parent component definition comprises a target key definition, the target key

3   definition corresponding to a target key of the first parent table;

-73-

4   the first child component definition comprises a foreign key definition, the foreign key

5   definition corresponding to a foreign key of the first child table; and

6   the first parent record corresponds to the parent of the first child record when the target key

7   of the first parent record comprises a value of the foreign key of the first child record.

1   67.   The computer system of claim 65 wherein

2   the SQL integration component definitions further comprise:

3   a third component definition, the third component definition corresponding to a third

4   table of the tables;

5   the first parent component definition corresponds to a second child component definition of a

6   second parent/child relationship;

7   the third component definition corresponds to a second parent component definition of the

8   second parent/child relationship; and

9   the constructing instructions further comprise:

10   third constructing instructions to construct a third SQL statement for selecting a third

11   record from the third table, the third record corresponding to a parent of the

12   first parent record.

1   68.   A computer system comprising:

2   a processor; and

3   a memory, the memory comprising instructions, the processor for executing the instructions,

4   the instructions comprising:

5   obtaining instructions to obtain an operation to be performed on a data set and

6   corresponding input data;

7   constructing instructions to construct at least one SQL statement to perform the

8   operation on the data set according to the input data; and

9   executing instructions to execute each SQL statement of the at least one SQL

10   statement on the data set once said each SQL statement is constructed such

11   that said each SQL statement is executed prior to constructing a subsequent

12   SQL statement of the at least one SQL statement.

1   69.   The computer system of claim 68 wherein

2   the constructing instructions comprise subsequent constructing instructions to construct the

3   subsequent SQL statement using a result set of executing a prior SQL statement.

-74-

1   70.   A computer program product comprising:

2   computer instructions comprising:

3   obtaining instructions to obtain an operation to be performed on a data set and

4   corresponding input data;

5   structure determining instructions to use a SQL integration object definition to

6   determine a structure of the data set; and

7   constructing instructions to construct at least one SQL statement conforming to the

8   structure to perform the operation on the data set according to the input data,

9   wherein executing the at least one SQL statement on the data set performs the

10   operation;

11   and

12   a computer-readable medium to store the obtaining instructions, the structure determining

13   instructions, and the constructing instructions.

1   71.   The computer program product of claim 70 wherein

2   the computer instructions further comprise:

3   executing instructions to execute the at least one SQL statement; and

4   the computer-readable medium further stores the executing instructions.

1   72.   The computer program product of claim 70 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, wherein

7   the parent component definition corresponds to a parent table of the tables;

8   and

9   the parent component definition comprises a target key definition, the target

10   key definition corresponding to a target key of the parent table;

11   a child component definition of the parent/child relationship, wherein

12   the child component definition corresponds to a child table of the tables; and

13   the child component definition comprises a foreign key definition, the foreign

14   key definition corresponding to a foreign key of the child table;

15   the computer instructions further comprise:

16   parent determining instructions to determine that a parent record of the parent table

17   corresponds to a parent of a child record of the child table when the target key

18   of the parent record comprises a value of the foreign key of the child record;

19   and

20   the computer-readable medium further stores the parent determining instructions.

1   73.   The computer program product of claim 70 wherein

2   the computer instructions further comprise:

3   instance identifying instructions to identify an instance of the SQL integration object

4   definition in the input data;

5   the SQL integration object definition comprises a SQL integration component definition;

6   the SQL integration component definition corresponds to a table of the data set;

7   the SQL integration component definition comprises a SQL integration field definition;

8   the SQL integration field definition corresponds to a column of the table;

9   the constructing instructions comprise:

10   value determining instructions to use the instance to identify a data value for an input

11   instance of the SQL integration field definition in the input data; and

12   concatenating instructions to concatenate a clause to a first SQL statement of the at

13   least one SQL statement to select a record from the table, the record having

14   the data value for the column;

15   and

16   the computer-readable medium further stores the instance identifying instructions, the value

17   determining instructions, and the concatenating instructions.

1   74.   The computer program product of claim 73 wherein

2   the instance identifying instructions further identify a second input instance of the SQL

3   integration object definition in the input data; and

4   the constructing instructions further perform the following:

5   use the second instance to identify a second data value for the SQL integration field

6   definition; and

7   concatenate an OR clause to the first SQL statement to select a second record from

8   the table, the second record having the second data value for the column.

1   75.   The computer program product of claim 73 wherein

2   the computer instructions further comprise:

3   length determining instructions to determine whether the first SQL statement

4   comprises a maximum number of SQL clauses, and

5   when the first SQL statement comprises the maximum number,

6   construct a new SQL statement;

7   and

8   when the first SQL statement does not comprise the maximum number,

9   perform the concatenating the clause to the first SQL statement;

10 and

11 the computer-readable medium further stores the length determining instructions.

1   76.   The computer program product of claim 70 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the constructing instructions comprise:

6   selecting instructions to select a current component definition of the SQL integration

7   component definitions, the current component definition corresponding to a

8   current table of the tables; and

9   generating instructions to perform the following:

10   when the input data comprises an instance of the current component definition,

11   generate a first SQL statement to select a record from the current table,

12   the record corresponding to the instance; and

13   when the input data does not comprise the instance and the input data

14   comprises a descendant instance of a descendant component definition

15   of the current component definition, generate a second SQL statement

16   to select all records from the current table;

17 and

18 the computer-readable medium further stores the selecting instructions and the generating

19   instructions.

1   77.   The computer program product of claim 76 wherein

2   the generating instructions further comprise:

3   hierarchy determining instructions to determine whether a hierarchy of output data is

4   limited when the input data does not comprise the instance and the input data

5   does not comprise the descendant instance; and

6   child generating instructions to perform the following:

7   when the hierarchy is not limited,

8   determine whether the SQL integration object definition comprises a

9   child component definition of the current component definition,

10   the child component definition corresponding to a child table of

11   the tables, and

12   when the child component definition exists,

13   generate a third SQL statement to select all records

14   from the child table;

15 and

16 the computer-readable medium further stores the hierarchy determining instructions and the

17   child generating instructions.

1   78.   The computer program product of claim 70 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, the parent component

7   definition corresponding to a parent table of the data set; and

8   a child component definition of the parent/child relationship, the child component

9   definition corresponding to a child table of the data set;

10 the constructing instructions further comprise:

11   current component constructing instructions to construct a current component SQL

12   statement for the child component definition to select a child record of the

13   child table corresponding to a child instance of the child component definition

14   from the input data;

15   parent identifying instructions to use the parent/child relationship for identifying the

16   parent component definition, the parent component definition determining a

17   parent result set, the parent result set comprising a parent instance; and

-78-

18   parent selection clause adding instructions to use the parent result set to add a parent

19   selection clause to the current component SQL statement to provide a final

20   SQL statement;

21 and

22 the computer-readable medium further stores the current component constructing

23   instructions, the parent identifying instructions, and the parent selection clause adding

24   instructions.

1   79. The computer program product of claim 78 wherein

2 the parent selection clause adding instructions comprise:

3   parent instance clause generating instructions to generate a parent instance clause to

4   select the child record from the child table, wherein

5   the parent instance clause further selects the child record when the foreign key

6   of the child record comprises a value of the target key from the parent

7   instance;

8 and

9 the computer-readable medium further stores the parent instance clause generating

10   instructions.

1   80. The computer program product of claim 70 wherein

2 the operation comprises upserting the input data into a destination data set;

3 the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5 the data set comprises a plurality of tables;

6 a first component definition of the SQL integration component definitions comprises a parent

7   component definition of a parent/child relationship, the parent component definition

8   corresponding to a parent table of the destination data set;

9 a second component definition of the SQL integration component definitions comprises a

10   child component definition of the parent/child relationship, the child component

11   definition corresponding to a child table of the destination data set;

12 the constructing instructions comprise:

13   selecting instructions to select a current component definition of the SQL integration

14   component definitions, the current component definition corresponding to a

15   current table of the tables; and

16   performing instructions to perform the following for the current component definition:

17   when the current component definition is the child component definition,

18   check whether an optimized upsert of a plurality of current component

19   instances of the current component definition from the input

20   data can be performed; and

21   when the optimized upsert can be performed,

22   construct a first set of at least one SQL statement for

23   performing the optimized upsert on the child

24   table, and

25   when the optimized upsert cannot be performed,

26   construct a second set of at least one SQL statement to

27   upsert the current component instances into the

28   child table;

29   and

30   when the current component definition is not the child component definition,

31   construct a third set of at least one SQL statement to upsert the current

32   component instances into the current table;

33 and

34 the computer-readable medium further stores the selecting instructions and the performing

35   instructions.

1   81.   The computer program product of claim 80 wherein the performing

2   instructions to construct the first set comprise:

3   calculating instructions to perform the following:

4   select a current parent instance of the parent component definition from the input

5   data;

6   determine a number of child instances of the child component definition from the

7   input data, the child instances corresponding to children of the current parent

8   instance;

9   retrieve a parent record corresponding to the current parent instance from the parent

10   table;

11   determine a number of child records from the child table, wherein the child records

12   are children records of the parent record; and

13   determine a ratio of the number of children instances to the number of child records,

-80-

14   and

15   when the ratio exceeds a predetermined limit,

16.   determine in memory an associated operation of an update operation and an

17.   insert operation for each child instance of the child instances,

18   and

19   when the ratio does not exceed the predetermined limit,

20.   access the destination data set for each child instance of the child instances to

21   determine the associated operation for each child instance of the child

22   instances;

23   and

24   the computer-readable medium further stores the calculating instructions.

1   82.   The computer program product of claim 81 wherein

2   the calculating instructions to determine in memory the associated operation for each child

3   instance of the child instances comprise:

4   retrieving instructions to retrieve children records of the parent record from the child

5   table into memory; and

6   in-memory instructions to perform the following for each child instance of the child

7   instances:

8   select the child instance as a current child instance of the child instances;

9   use the children records in memory to determine the associated operation for

10   the current child instance; and

11   construct an associated SQL statement for performing the associated operation

12   on the child table;

13   and

14   the computer-readable medium further stores the retrieving instructions and the in-memory

15   instructions.

1   83.   The computer program product of claim 70 wherein

2   the operation is a delete record hierarchy operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the SQL integration component definitions comprise:

6   a root component definition, the root component definition corresponding to a root

7   table of a plurality of tables of the destination data set;

8   a descendant component definition, the descendant component definition

9   corresponding to a descendant table of the tables, the descendant component

10   definition corresponding to a descendant of the root component definition;

11   the constructing instructions further comprise:

12   root selecting instructions to select a root instance of the root component definition

13   from the input data;

14   root marking instructions to mark a root record of the root table corresponding to the

15   root instance;

16   descendant selecting instructions to perform the following:

17   when a cascade delete parameter is set for the descendant component

18   definition,

19   select at least one descendant record of the descendant table wherein

20   the at least one descendant record corresponds to a descendant

21   of the root record, and

22   mark the at least one descendant record;

23   root constructing instructions to construct a root SQL statement to delete the marked

24   root record from the root table; and

25   descendant constructing instructions to construct a descendant SQL statement to

26   delete the at least one marked descendant record from the descendant table;

27   and

28   the computer-readable medium further stores the root selecting instructions, the root marking

29   instructions, the descendant selecting instructions, the root constructing selections,

30   and the descendant constructing instructions.

1   84.   The computer program product of claim 70 wherein

2   the operation comprises a reverse query operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   the SQL integration component definitions comprise:

7   a first parent component definition of a first parent/child relationship, the first parent

8   component definition corresponding to a first parent table of the tables;

9   a first child component definition of the first parent/child relationship, the first child

-82-

10   component definition corresponding to a first child table of tables;

11   and

12   the constructing instructions comprise:

13   first constructing instructions to construct a first SQL statement for selecting a first

14   child record from the first child table, wherein

15   the first child record corresponds to an instance of the first child component

16   definition from the input data;

17   and

18   second constructing instructions to construct a second SQL statement for selecting a

19   first parent record from the first parent table, wherein the first parent record

20   corresponds to a parent of the first child record.

1   85.   The computer program product of claim 84 wherein

2   the first parent component definition comprises a target key definition, the target key

3   definition corresponding to a target key of the first parent table;

4   the first child component definition comprises a foreign key definition, the foreign key

5   definition corresponding to a foreign key of the first child table; and

6   the first parent record corresponds to the parent of the first child record when the target key

7   of the first parent record comprises a value of the foreign key of the first child record.

1   86.   The computer program product of claim 84 wherein

2   the SQL integration component definitions further comprise:

3   a third component definition, the third component definition corresponding to a third

4   table of the tables;

5   the first parent component definition corresponds to a second child component definition of a

6   second parent/child relationship;

7   the third component definition corresponds to a second parent component definition of the

8   second parent/child relationship;

9   the constructing instructions further comprise:

10   third constructing instructions to construct a third SQL statement for selecting a third

11   record from the third table, the third record corresponding to a parent of the

12   first parent record;

13   and

14   the computer-readable medium further stores the third constructing instructions.

-83-

1   87.   A computer program product comprising:

2   computer instructions comprising:

3   obtaining instructions to obtain an operation to be performed on a data set and

4   corresponding input data;

5   constructing instructions to construct at least one SQL statement to perform the

6   operation on the data set according to the input data; and

7   executing instructions to execute each SQL statement of the at least one SQL

8   statement on the data set once said each SQL statement is constructed such

9   that said each SQL statement is executed prior to constructing a subsequent

10   SQL statement of the at least one SQL statement;

11 and

12 a computer-readable medium to store the obtaining instructions, the constructing instructions,

13   and the executing instructions.

1   88.   The computer program product of claim 87 wherein

2   the constructing instructions comprise subsequent constructing instructions to construct the

3   subsequent SQL statement using a result set of executing a prior SQL statement.

1   89.   A system comprising:

2   obtaining means for obtaining an operation to be performed on a data set and corresponding

3   input data;

4   structure determining means for determining a SQL integration object definition to determine

5   a structure of the data set; and

6   constructing means for constructing at least one SQL statement conforming to the structure to

7   perform the operation on the data set according to the input data, wherein executing

8   the at least one SQL statement on the data set performs the operation.

1   90.   The system of claim 89 further comprising:

2   executing means for executing the at least one SQL statement.

1   91.   The system of claim 89 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

-84-

5   the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, wherein

7   the parent component definition corresponds to a parent table of the tables;

8   and

9   the parent component definition comprises a target key definition, the target

10   key definition corresponding to a target key of the parent table; and

11   a child component definition of the parent/child relationship, wherein

12   the child component definition corresponds to a child table of the tables; and

13   the child component definition comprises a foreign key definition, the foreign

14   key definition corresponding to a foreign key of the child table;

15   and further comprising:

16   parent determining means for determining that a parent record of the parent table corresponds

17   to a parent of a child record of the child table when the target key of the parent record

18   comprises a value of the foreign key of the child record.

1   92.   The system of claim 89 further comprising:

2   instance identifying means for identifying an instance of the SQL integration object definition

3   in the input data;

4   and wherein

5   the SQL integration object definition comprises a SQL integration component

6   definition;

7   the SQL integration component definition corresponds to a table of the data set;

8   the SQL integration component definition comprises a SQL integration field

9   definition;

10   the SQL integration field definition corresponds to a column of the table;

11   and

12   the constructing means comprise:

13   value determining means for using the instance to identify a data value for an

14   input instance of the SQL integration field definition in the input data;

15   and

16   concatenating means for concatenating a clause to a first SQL statement of the

17   at least one SQL statement to select a record from the table, the record

18   having the data value for the column.

1   93.   The system of claim 92 wherein

2   the instance identifying means further comprise second instance identifying means for

3   identifying a second input instance of the SQL integration object definition in the

4   input data; and

5   the constructing means further comprise:

6   second value determining means for using the second instance to identify a second

7   data value for the SQL integration field definition; and

8   concatenating means for concatenating an OR clause to the first SQL statement to

9   select a second record from the table, the second record having the second data

10   value for the column.

1   94.   The system of claim 92 wherein the further comprising:

2   length determining means for determining whether the first SQL statement comprises a

3   maximum number of SQL clauses, and

4   when the first SQL statement comprises the maximum number,

5   constructing a new SQL statement,

6   and

7   when the first SQL statement does not comprise the maximum number,

8   performing the concatenating the clause to the first SQL statement.

1   95.   The system of claim 89 wherein

2   the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4   the data set comprises a plurality of tables;

5   the constructing means comprise:

6   selecting means for selecting a current component definition of the SQL integration

7   component definitions, the current component definition corresponding to a

8   current table of the tables; and

9   generating means for performing the following:

10   when the input data comprises an instance of the current component definition,

11   generating a first SQL statement to select a record from the current

12   table, the record corresponding to the instance; and

-86-

13 when the input data does not comprise the instance and the input data

14   comprises a descendant instance of a descendant component definition

15   of the current component definition, generating a second SQL

16   statement to select all records from the current table.

1 96. The system of claim 95 wherein the generating means further comprise:

2 hierarchy determining means for determining whether a hierarchy of output data is

3   limited when the input data does not comprise the instance and the input data

4   does not comprise the descendant instance; and

5 child generating means for

6   determining, when the hierarchy is not limited, whether the SQL

7   integration object definition comprises a child component

8   definition of the current component definition, the child

9   component definition corresponding to a child table of the

10   tables, and

11   generating, when the child component definition exists, a third SQL

12   statement to select all records from the child table.

1 97. The system of claim 89 wherein

2 the SQL integration object definition comprises a plurality of SQL integration component

3   definitions;

4 the data set comprises a plurality of tables;

5 the SQL integration component definitions comprise:

6   a parent component definition of a parent/child relationship, the parent component

7   definition corresponding to a parent table of the data set; and

8   a child component definition of the parent/child relationship, the child component

9   definition corresponding to a child table of the data set;

10 and

11 the constructing means further comprise:

12   current component constructing means for constructing a current component SQL

13   statement for the child component definition to select a child record of the

14   child table corresponding to a child instance of the child component definition

15   from the input data;

16 parent identifying means for using the parent/child relationship for identifying the

17   parent component definition, the parent component definition determining a

18   parent result set, the parent result set comprising a parent instance; and

19   parent selection clause adding means for using the parent result set to add a parent

20   selection clause to the current component SQL statement to provide a final

21   SQL statement.

1   98.   The system of claim 97 wherein

2   the parent selection clause adding means comprise:

3   parent instance clause generating means for generating a parent instance clause to

4   select the child record from the child table, wherein

5   the parent instance clause further selects the child record when the foreign key

6   of the child record comprises a value of the target key from the parent

7   instance.

1   99.   The system of claim 89 wherein

2   the operation comprises upserting the input data into a destination data set;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   a first component definition of the SQL integration component definitions comprises a parent

7   component definition of a parent/child relationship, the parent component definition

8   corresponding to a parent table of the destination data set;

9   a second component definition of the SQL integration component definitions comprises a

10   child component definition of the parent/child relationship, the child component

11   definition corresponding to a child table of the destination data set;

12 and

13 the constructing means comprise:

14   selecting means for selecting a current component definition of the SQL integration

15   component definitions, the current component definition corresponding to a

16   current table of the tables; and

17   performing means for performing the following for the current component definition:

18   when the current component definition is the child component definition,

19   checking whether an optimized upsert of a plurality of current

20   component instances of the current component definition from

21   the input data can be performed; and

22   when the optimized upsert can be performed,

23   constructing a first set of at least one SQL statement for

24   performing the optimized upsert on the child

25   table;

26   when the optimized upsert cannot be performed,

27   constructing a second set of at least one SQL statement

28   to upsert the current component instances into

29   the child table;

30   when the current component definition is not the child component definition,

31   constructing a third set of at least one SQL statement to upsert the

32   current component instances into the current table.

1   100.   The system of claim 99 wherein the performing means for constructing the

2   first set comprises:

3   calculating means for performing the following:

4   selecting a current parent instance of the parent component definition from the input

5   data;

6   determining a number of child instances of the child component definition from the

7   input data, the child instances corresponding to children of the current parent

8   instance;

9   retrieving a parent record corresponding to the current parent instance from the parent

10   table;

11   determining a number of child records from the child table, wherein the child records

12   are children records of the parent record; and

13   determining a ratio of the number of children instances to the number of child records,

14   and

15   when the ratio exceeds a predetermined limit,

16   determining in memory an associated operation of an update operation and an

17   insert operation for each child instance of the child instances,

18   and

19   when the ratio does not exceed the predetermined limit,

20   accessing the destination data set for each child instance of the child instances

21   to determine the associated operation for each child instance of the

-89-

22   child instances.

1   101.   The system of claim 100 wherein

2   the calculating means for determining in memory the associated operation for each child

3   instance of the child instances comprise:

4   retrieving means for retrieving children records of the parent record from the child

5   table into memory; and

6   in-memory means for performing the following for each child instance of the child

7   instances:

8   selecting the child instance as a current child instance of the child instances;

9   using the children records in memory to determine the associated operation for

10   the current child instance; and

11   constructing an associated SQL statement for performing the associated

12   operation on the child table.

1   102.   The system of claim 101 wherein

2   the operation is a delete record hierarchy operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the SQL integration component definitions comprise:

6   a root component definition, the root component definition corresponding to a root

7   table of a plurality of tables of the destination data set;

8   a descendant component definition, the descendant component definition

9   corresponding to a descendant table of the tables, the descendant component

10   definition corresponding to a descendant of the root component definition;

11   and

12   the constructing means further comprise:

13   root selecting means for selecting a root instance of the root component definition

14   from the input data;

15   root marking means for marking a root record of the root table corresponding to the

16   root instance;

17   descendant selecting means for performing the following:

18   when a cascade delete parameter is set for the descendant component

19   definition,

20   selecting at least one descendant record of the descendant table

21   wherein the at least one descendant record corresponds to a

22   descendant of the root record, and

23   marking the at least one descendant record;

24   root constructing means for constructing a root SQL statement to delete the marked

25   root record from the root table; and

26   descendant constructing means for constructing a descendant SQL statement to delete

27   the at least one marked descendant record from the descendant table.

1   103.   The system of claim 89 wherein

2   the operation comprises a reverse query operation;

3   the SQL integration object definition comprises a plurality of SQL integration component

4   definitions;

5   the data set comprises a plurality of tables;

6   the SQL integration component definitions comprise:

7   a first parent component definition of a first parent/child relationship, the first parent

8   component definition corresponding to a first parent table of the tables; and

9   a first child component definition of the first parent/child relationship, the first child

10   component definition corresponding to a first child table of tables;

11   and

12   the constructing means comprise:

13   first constructing means for constructing a first SQL statement for selecting a first

14   child record from the first child table, wherein

15   the first child record corresponds to an instance of the first child component

16   definition from the input data;

17   and

18   second constructing means for constructing a second SQL statement for selecting a

19   first parent record from the first parent table, wherein the first parent record

20   corresponds to a parent of the first child record.

1   104.   The system of claim 103 wherein

2   the first parent component definition comprises a target key definition, the target key

3   definition corresponding to a target key of the first parent table;

4   the first child component definition comprises a foreign key definition, the foreign key

-91-

5   definition corresponding to a foreign key of the first child table; and

6   the first parent record corresponds to the parent of the first child record when the target key

7   of the first parent record comprises a value of the foreign key of the first child record.

1   105.   The system of claim 104 wherein

2   the SQL integration component definitions further comprise:

3   a third component definition, the third component definition corresponding to a third

4   table of the tables;

5   the first parent component definition corresponds to a second child component definition of a

6   second parent/child relationship;

7   the third component definition corresponds to a second parent component definition of the

8   second parent/child relationship; and

9   the constructing means further comprise:

10   third constructing means for constructing a third SQL statement for selecting a third

11   record from the third table, the third record corresponding to a parent of the

12   first parent record.

1   106.   A system comprising:

2   obtaining means for obtaining an operation to be performed on a data set and corresponding

3   input data;

4   constructing means for constructing at least one SQL statement to perform the operation on

5   the data set according to the input data; and

6   executing means for executing each SQL statement of the at least one SQL statement on the

7   data set once said each SQL statement is constructed such that said each SQL

8   statement is executed prior to constructing a subsequent SQL statement of the at least

9   one SQL statement.

1   107.   The system of claim 106 wherein

2   the constructing means comprise subsequent constructing means for constructing the

3   subsequent SQL statement using a result set of executing a prior SQL statement.

1   108.   A signal embodied in a carrier wave comprising:

2   obtaining instructions to obtain an operation to be performed on a data set and corresponding

3   input data;

4   structure determining instructions to use a SQL integration object definition to determine a

-92-

5   structure of the data set; and

6   constructing instructions to construct at least one SQL statement conforming to the structure

7   to perform the operation on the data set according to the input data, wherein executing

8   the at least one SQL statement on the data set performs the operation.

1   109.   The signal of claim 108 wherein the signal further comprises:

2   executing instructions to execute the at least one SQL statement.

1   110.   A signal embodied in a carrier wave comprising:

2   obtaining instructions to obtain an operation to be performed on a data set and corresponding

3   input data;

4   constructing instructions to construct at least one SQL statement to perform the operation on

5   the data set according to the input data; and

6   executing instructions to execute each SQL statement of the at least one SQL statement on

7   the data set once said each SQL statement is constructed such that said each SQL

8   statement is executed prior to constructing a subsequent SQL statement of the at least

9   one SQL statement.

1   111.   The signal of claim 110 wherein

2   the constructing instructions comprise subsequent constructing means for constructing the

3   subsequent SQL statement using a result set of executing a prior SQL statement.

1   112.   A signal embodied in a carrier wave comprising data produced by:

2   obtaining instructions to obtain an operation to be performed on a data set and corresponding

3   input data;

4   structure determining instructions to use a SQL integration object definition to determine a

5   structure of the data set; and

6   constructing instructions to construct at least one SQL statement conforming to the structure

7   to perform the operation on the data set according to the input data, wherein executing

8   the at least one SQL statement on the data set performs the operation.

1   113.   The signal of claim 112 wherein the data further comprises second data

2   produced by:

3   executing instructions to execute the at least one SQL statement.

1   114.   A signal embodied in a carrier wave comprising data produced by:

-93-

2   obtaining instructions to obtain an operation to be performed on a data set and corresponding

3   input data;

4   constructing instructions to construct at least one SQL statement to perform the operation on

5   the data set according to the input data; and

6   executing instructions to execute each SQL statement of the at least one SQL statement on

7   the data set once said each SQL statement is constructed such that said each SQL

8   statement is executed prior to constructing a subsequent SQL statement of the at least

9   one SQL statement.

1   115.   The signal of claim 114 wherein the data further comprises second data

2   produced by:

3   subsequent constructing means for constructing the subsequent SQL statement using a result

4   set of executing a prior SQL statement.